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Diagnosis and Treatment of Gout and Prevention of Hyperuricemia for Teachers in Colleges and Universities

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ABSTRACT. *Objective: To study diagnostic principles and treatment methods of gout disease, hence to provide guidance for college teachers to prevent hyperuricemia. Methods: Literature review method was applied to study causes, diagnosis and treatments of gout attack. Investigation method was used to study the occurrence of hyperuricemia in a university in recent years, and its changing trend and causes were analyzed. Results: Medical therapy for Hyperuricemia mainly includes alleviating acute attack, inhibiting uric acid synthesis and promoting uric acid excretion. The incidence of hyperuricemia in male teachers in the university is about 20%, which is significantly higher than that of female teachers of the same age. Conclusions: Teachers in Colleges and universities are the high incidence group of gout, we should strengthen health education and guidance of gout prevention on them.*

KEYWORDS: *Hyperuricemia, Gout, Medical treatment*

1. Introduction

Gout is an ancient and common chronic disease with a high incidence in China. In 1855, Alfred Baring Garrod published the first gout monograph and pointed out that the deposition of uric acid salt may be the cause of gout inflammation, rather than the consequences[1]. In 1961, Faires and McCarty injected urate crystals into their knee joints and cause gout attack. From then on, the causal relationship between gout and urate crystal was established[2].

The cause and harm of the increase of serum uric acid

Uric acid is generated via the liver metabolism of purine compound both from dietary intake and body decomposition. About 2/3 of uric acid is excreted by the kidney and 1/3 by the digestive tract[3]. Decreased excretion of uric acid is the main cause of the gout attack.

Age and sex, working style, exercises and other factors of people will lead to differences in the ability of excretion of uric acid. In addition, food, drugs and

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combined diseases are all related to gout attack[4].

2. Diagnosis of Gout

Gout can be divided into four pathological stages: hyperuricemia without urate crystal deposition or gout symptoms; crystal deposition occurs but no gout symptoms; crystal deposition occurs with acute onset of gout; progressive gout including the occurrence of gout stone, chronic gouty arthritis and imaging erosion[5].

For symptomatic gout patients, serum uric acid detection is helpful for diagnosis, but hyperuricemia alone is not enough to diagnose gout. In the acute attack stage of gout, the serum uric acid concentration can be reduced to normal level. If the diagnosis of gout is uncertain, the serum uric acid should be detected again after the attack. If it is greater than 0.327 mmol / L, it will be helpful for the diagnosis. The 'double contour sign' may appear in the ultrasonic examination of the affected bone and joint, that is, the linear strong echo appears near the articular cavity surface of the affected joint cartilage with a unclear contour. It combines with the high echo bone surface under the non echo cartilage to form two parallel strong echoes. The reason is that the crystal of urate deposits on the surface of articular cartilage. It also causes bone erosion, joint cavity effusion, synovial thickening and gouty stone. Dual energy CT (dual energy CT) imaging is a kind of inspection method, the sensitivity and specificity of which were 87% and 84% respectively[6]. The gold standard for the diagnosis of gout is to observe monosodium urate crystals in synovial fluid or gout nodule by polarizing microscope.

We can use a clinical diagnosis method ("rule") for gout possibility in patients with single arthritis, which is suitable for primary diagnosis and treatment where joint fluid analysis cannot be carried out. When the total score in the table is $\geqslant$ 8 points[7], it'll be classified as gout. See Table 1.

Table 1 Diagnostic Rule In Patients with Monoarthritis

Parameter	score
Male	2
Previous arthritis	2
Attack within 1 day	0.5
Joint reddening	1
Involvement of the first metatarsophalangeal joint	2.5
Hypertension or $\geqslant$ 1 cardiovascular disease risk factor	1.5
Serum uric acid >0.327mmol/l	3.5

3. Drug Treatment of Gout

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3.1 Indications for Treatment

There are several indications for treatment: Patients suffer 2 or more acute gout attacks each year;clinical or radiologic signs of joint injury show that gout stone can be touched or found;patients suffer chronic kidney disease of grade 2 or above, and still have recurrent uric acid kidney stone after treatment with rehydration and alkalized urine. In addition, it is also recommended to treat gout when the patient is below 40, or the level of serum uric acid is higher than 0.444mmol/l, or it is combined with hypertension, cardiovascular disease or heart failure. It is not recommended to treat hyperuricemia without any symptoms or complications. The treatment of gout includes acute attack treatment, prevention of gout recurrence and uric acid-reducing treatment[8-10].

3.2 Treatment during Acute Attack

Colchicine is recommended as the first-line drug in the United States and European gout guidelines. It is suggested that colchicine should be used within 12 to 36 hours after gout onset to get better curative effect. It is recommended to take 1 mg initially, add 0.5 mg one hour later, and take 0.5 mg one to three times a day after 12 hours[11]. Patients with renal insufficiency and those who are taking CYP450 enzyme inhibitors (cyclosporine, tacrolimus, clarithromycin, verapamil and diltiazem) at the same time should reduce the dosage. The dose for patients with liver dysfunction and those who are taking statins should also be reduced. Colchicine is not recommended when EGFR < 30ml / min. In addition, sufficient NSAIDs should be used to relieve symptoms in a short period of time after gout onset. It is recommended to use sufficient NSAIDs for 3 days, and then maintain at a lower dose for 4 to 7 days. For patients with more complications which are not suitable for NSAIDs, Glucocorticoids may be a better choice . If only 1 to 2 joints are involved, they can be injected directly into the joint cavity. In the case of systemic administration, continuous administration with 0.5 mg / (kg · d) prednisone could be given orally for 5 to 10 days , and then be stopped[12].

In the case of refractory acute gout, when colchicine, nonsteroidal anti-inflammatory drugs, or glucocorticoids are ineffective and there are contraindications with patients to use the above drugs, interleukin-1 (IL-1) receptor antagonists can be considered.

3.3 Uric Acid-Reducing Treatment

Before uric acid-reducing treatment, the patients with recent attacks (within 3 months), chronic gout synovitis (within 3 months) or gout stones should take preventive treatments against gout attack. The measures include small doses of colchicine: 0.5 mg once or twice a day, or NSAIDS. If neither drug can be used, low doses of corticosteroids (⩽10mg) are recommended. Uric acid-reducing treatment must be carried out after the condition of gout patients is improved with the target

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being less than 0.333mmol/l (less than 0.278mmol / L for those with gout stones)[13].

3.3.1 To Inhibit Uric Acid Synthesis

Xanthine oxidase inhibitors, including allopurinol and febuxostat, are major uric acid-reducing drugs. Allopurinol was initially used with a low dose (typically 100 mg/d in patients with a weight-adjusted creatinine clearance rate higher than 60 mL/min), and an increase of 100 mg/d every 4 weeks to bring uric acid to standard level, but the maximum dose should be no more than 600 mg/d. The recommended dose for G3 and G4-stage patients is 50□ 100 mg/d. Patients of G5 stage should contraindicate these drugs. For patients who need testing but cannot perform it, allopurinol should be used in accordance with standard medication guidelines. And appropriate precautions should be taken based on the condition of patient's renal function, potential risk of adverse reactions and other co-existing diseases. At the same time, the patient should be informed to stop medication immediately in case of rash or other possible signs of adverse reactions[14].

Febuxostat is a novel selective xanthine oxidase inhibitor. For patients with no increased cardiovascular risk, febuxostat is still a reasonable alternative to uricosuric medicine or allopurinol[15].

3.3.2 To Promote Uric Acid Excretion

Propane sulfonate is the first choice of uric acid excretion drugs. It is usually used twice a day, 250mg each time, up to 2000-3000mg/d[16]. Daily dose of no more than 50mg of benabromaloneis is less likely to cause serious hepatotoxicity. It is not recommended to used by patients with liver disease. And when used for a long time, it should be avoided to use it together with other drugs with liver damage, and liver function of patients should be checked regularly[17].

3.3.3 Combined with Recombinant Uricase

These drugs convert uric acid into more water-soluble and easily excreted allantoins, including rasburicase and pegloticase. Labradase is a recombinant uric acid oxidase, which is mainly used for the prevention and treatment of acute hyperuricemia in patients with hematological malignancies. Pegloticase is a pegylated recombinant uric acid oxidase which is suitable for most refractory gout and can be used in adults with refractory gout who have poor efficacy with other drugs or have contraindications. The main adverse reactions of pegloticase include serious cardiovascular events, transfusion reactions and immunogenic reactions[18].

4. Prevention and Guidance of Gout among College Teachers

College teachers, who are mainly mental labors, usually have less outdoor exercises and less digestive tract and renal excretion of uric acid, hence they are the group with a high incidence of gout. It has important significance to study the

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outbreak of gout disease among college teachers and provide prevention and guidance positively for them to maintain their health. The occurrence of hyperuricemia in physical examination for three consecutive years in a university is shown as table 2.

Table 2 Occurrence of Hyperuricemia in Physical Examination for Three Consecutive Years in a University

year	number of hyperuricemia cases				Number of participants				The proportion of hyperuricemia /%			
	35~60 years old		over 60 years old		35~60 years old		over 60 years old		35~60 years old		over 60 years old	
	male	female	male	female	male	female	male	female	male	female	male	female
2016	160	23	136	53	848	1576	738	1097	18.87	1.46	18.43	4.83
2017	201	22	149	53	838	1511	774	1153	23.99	1.46	19.25	4.6
2018	247	95	160	100	1050	1758	702	1043	23.52	5.4	22.79	9.59

Table 2 shows that the incidence of hyperuricemia in women is significantly lower than that in men of the same age, but it is significantly increased after the age of 60, which is considered to be the cause of the decreased hormone level after menopause. The incidence of hyperuricemia was not higher in men over 60 than in men under 60. In addition, the incidence of high uric acid increases with age, especially in people over 60 years old, suggesting that renal function reduction has effects on uric acid excretion.

Besides drug treatments, it is suggested that teachers with gout and high-risk groups should eat a reasonable diet, avoid high purine food and excessive intake of protein, and eat more alkaline food. For most patients with normal cardiopulmonary function, daily drinking water at 2.5~3.0L. Appropriate amount of exercises are recommended for it can strengthen cardiopulmonary function and accelerate the blood circulation, hence promote the excretion of uric acid. Obese or overweight patients should stick to losing weight and maintained the BMI at 20 to 24 kg/m^2 . It is very important for teachers with gout and high-risk groups to quit smoking and restrict alcohol, maintain a good and peaceful mind, improve renal function and use medicines rationally in order to control uric acid at a normal level, reduce the frequency of acute gout attacks.

5. Conclusion

The prevention and treatment of college teachers should start from advocating healthy lifestyle, good living habits, scientific exercises, and urging them to seek medical advice actively, carry out necessary regular physical examination. Above all, carrying out long-term effective prevention and treatment measures are of great significance.

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